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Relativistic Heavy Ion Collider
Magnet Division Specification

Spec. No.: RHIC-MAG-R-7536

Issue Date: May 8, 1995

Rev. No.: A

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Class: Arc Dipole Assembly
Title: Station 1, Receipt Inspection

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REVISION RECORD

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1. Scope:

This specification describes the initial Mechanical and Electrical inspections procedures for the RHIC ARC Dipole Magnet manufactured by Grumman. These procedures will be used as follows:

1. To acknowledge BNL receipt of the magnet assembly.
2. To conduct initial mechanical and electrical inspections for the purpose of ascertaining any shipping damage.
3. As a preliminary inspection to evaluate the quality of the magnet as it is received from Grumman in terms of compliance to the procurement specification.

2. Applicable Documents:

The following documents of the issue in effect on the issue date of this procedure form a part of this specification to the extent specified.

RHIC Drawing No. 12065000	Magnet Assembly
RHIC Drawing No. 12065088	Magnet Assembly Verification
RHIC-MAG-M-7543	Reassembly of Magnet from Grumman
RHIC-MAG-R-7228	RHIC Magnet Coil Inductance and Q Measurements
RHIC-MAG-R-7242	RHIC Hypot Testing
RHIC-MAG-R-7243	RHIC Low Precision Resistance/ Continuity/Insulation Test
RHIC-MAG-R-7320	RHIC Electrical Resistance Measurement for Collared Individual Coils and Connected Coil Sets

3. Requirements:

3.1 Material/Equipment:

RHIC Drawing No. 25-1275.01-5A	Primary Storage Stand
RHIC Drawing No. 25-1423.01-4	Annex Lift Beam Assembly
RHIC Drawing No. 25-1537.01-5B	Inspection Mask

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3.2 Safety Precautions:

- 3.2.1 It is imperative that safety precautions be strictly adhered to during all installation procedures given below. Two technicians, at a minimum, must be present at all times during performance of installation activities.
- 3.2.2 Safety shoes must be worn at all times during installation procedure.
- 3.2.3 Safety glasses must be worn during potential eye damaging operations.
- 3.2.4 Hard hats must be worn during crane operations.

3.3 Procedure:

Note: Unless specifically noted otherwise, all steps are to be performed by the Mechanical Support Group.

- 3.3.1 Upon arrival of the Grumman truck delivering the ARC Dipole Magnet, and before unloading the Magnet from the truck, perform the following steps:
 - 3.3.1.1 Obtain the traveler assigned to the Magnet.
 - 3.3.1.2 Record the following information in the traveler:
 - a) magnet serial number;
 - b) arrival date;
 - c) arrival time ($\pm \frac{1}{2}$ hour);
 - d) travel time ($\pm \frac{1}{2}$ hour);
 - e) outside ambient temperature in degrees F

Note: Use BNL weather service recording at x2263.

- 3.3.1.3 Remove the protective cover from the cryostat.
- 3.3.1.4 Verify that the end item documentation package and supplementary parts container have been provided with the Magnet. Deliver the end item documentation package to the magnet database administrator.

IF they have not been provided,

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THEN notify your supervisor and continue performing the steps in this procedure.

- 3.3.1.5 Perform a visual inspection and verify that all of the following are true:
- a) The contents of the shipment matches the Seller's packing slip;
 - b) Part number, revision level, and serial number are as indicated on the Seller's packing slip;
 - c) Protective covers on the ends of the Magnet are properly installed;
 - d) Protective covers on the shipping ports are properly installed;
 - e) Accelerometer is properly mounted;
 - f) Temperature probe is properly mounted;
 - g) General cleanliness is acceptable.
- 3.3.1.6 Turn off and disconnect the nitrogen supply to the cryostat.
- 3.3.1.7 Remove the shipping protective covers from both ends.
- 3.3.1.8 Disconnect and remove the accelerometer and the thermometer cable from the cryostat and stow it in the transport locker on the truck.
- 3.3.1.9 Stow any Grumman-provided parts left over from disassembly of a previously delivered magnet, such as nuts and bolts, in the transport locker.
- 3.3.2 Unload the Magnet from the truck and move it to Area 1 by performing the following steps:
- Caution: Wear a hard hat during crane operations.**
- 3.3.2.1 Notify the rigging crew that the Magnet is to be moved.
- 3.3.2.2 Assist the riggers in attaching the Annex Lift Beam Assembly (25-1423.03-4) to the Magnet assembly.
- 3.3.2.3 Mechanically disconnect the Magnet assembly from the trailer shock mounts. There are six shock mounts.

Notes: 1) At this point, the riggers will move the Magnet to Area 1. They should place the Magnet on the Primary Storage

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Stands in Area 1, taking care that the pins on the Storage Stands line up with the holes in the cryostat.

- 2) It is not necessary to mechanically secure the Magnet to the Primary Storage Stands.

3.3.2.4 Attach the traveler to the cryostat.

3.3.3 At Area 1, perform a visual inspection and verify that all of the following are true:

- a) Wiring at both ends is neatly tied with no obvious damage;
- b) The inside of the helium pipes and beam tube are free of obvious debris;
- c) The end volume flanges are not dinged.

3.3.4 Affix labels to the Magnet as follows:

- a) Two "LEAD END" labels on both sides of the lead end of the Magnet on the cryostat. They should be placed about one inch from the end of the painted section of the cryostat, just above the colored stripe.

Note: Looking down the length of the magnet, the lead end will have the heat shield line in the lower right quadrant.

- b) Four labels indicating the serial number of the Magnet. Two of the labels should be placed next to the "LEAD END" labels, on the painted section of the cryostat. Two of the labels should be placed at the non-lead end of the Magnet, about one inch from the end of the painted section of the cryostat, just above the colored stripe.

3.3.5 Remove the Grumman-installed shipping restraint in the center mount.

3.3.6 Perform a visual inspection and verify that all of the following are true:

- a) Inside of vacuum vessel legs are clean;
- b) No cracks are present in the support posts;

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c) No debris from the shipping restraint is present.

- 3.3.7 Measure the clearance between the sliding post keyways and the cradle guide pin sleeves ("magnet post stoppers") in the end posts. Verify that the outboard clearance at each end post is less than 0.030 inches.
- 3.3.8 Install the insulating baffles, both vacuum vessel end post covers, and the center post cover. Refer to RHIC-MAG-M-7543 for the proper procedure.
- 3.3.9 Coat the external O-ring surfaces with a light film of vacuum pump oil as a rust preventative measure.
- 3.3.10 Clean the beam tube and the He lines, using dry nitrogen gas to force a close-fitting ball of aluminum foil wrapped with several layers of lint-free cloth saturated with Ethyl alcohol through the tube and He lines. Continue this procedure until no foreign matter is seen on the lint-free cloth.
- 3.3.11 Perform alignment checks on the cryogenic lines with respect to the cold mass (Ref: BNL Verification Drawing 12065088), using the Dipole Cryogenic Pipe Inspection Mask (25-1537.01-5B).

Note: The mask provides information on the position of the following cryogenic lines at both ends of the magnet:

He Supply Line
He Return Line
Utility Line
Shield Line : X-Direction Only

Check off the "Accept" space in the traveler for each line at both ends, if alignment is correct. Note that if pipes do not rest in their proper location, but can be moved into proper location by hand, this is acceptable.

- 3.3.12 Return all Grumman supplied parts for shipment of the Magnet: i.e., PAL Instrumentation Box, shipping restraints, bolts, covers, tygon tubing, etc.

IF the truck is still present, THEN place the parts in the transport locker

IF the truck has left, THEN hold the parts aside for shipment on the next Grumman truck.

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- 3.3.13 Upon receipt of instructions to move the Magnet to Area 2, perform the following steps:

Caution: Wear a hard hat during crane operations.

- 3.3.13.1 Notify the rigging crew that the Magnet is to be moved.
- 3.3.13.2 Assist the riggers in attaching the Annex Lift Beam Assembly (25-1423.01-4) to the magnet assembly.
- 3.3.13.3 Mechanically disconnect the magnet assembly from the Primary Storage Stands.
- Note: At this point, the riggers will move the magnet to Area 2 and place it on the optical survey stand.
- 3.3.14 Perform optical survey inspections as per RHIC-MAG-M-7538.
- Note: Afterwards the riggers will move the magnet to Area 3.
- Perform electrical tests as per RHIC-MAG-R-7228, 7242, 7243 and 7320.
- 3.3.14.1 Hypot to ground at 5kV:
- All coils & upper bus
 Upper dipole bus to lower bus
 Quad bus - both bus leads
 Quad bus - upper to lower
- 3.3.14.2 Hypot individual warm-up heaters to ground at 2kV
- #1 BRN
 #2 RED
 #3 ORN
 #4 YEL
- 3.3.14.3 Hypot individual and all wires to ground at 5kV
- Dipole voltage tap, violet
 Quadrupole bus voltage tap, white
 Quadrupole bus trim S/C, Yellow

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- 3.3.14.4 DC Continuity DC resistance individual wires
 - Dipole bus voltage tap, violet
 - Quadrupole bus voltage tap, white
 - Quadrupole bus trim S/C, yellow
- 3.3.14.5 R, L & Q Checks at 1 amp/120 Hz
 - Full magnet, forward polarity
 - Full magnet, reverse polarity
 - Individual coils
- 3.3.14.6 DC resistance warm-up heaters at 1 amp
 - #1 BRN
 - #2 RED
 - #3 ORN
 - #4 YEL
- 3.3.14.7 DC resistance at 1 amp voltage tap (B) to end
 - Individual blue wire
- 3.3.14.8 DC continuity 200 Ω resistor check
 - #1 (A) red, #2 (B) white, #3 (C) black
- 3.3.14.9 Voltage tap/bus series voltage drop test at 1 amp
 - Series voltage drops/tap

4. Quality Assurance Provisions:

- 4.1 The quality assurance provisions of this procedure requires that the technician shall be responsible for performing all inspections and tests in compliance with the procedural instructions contained herein and the recording of test results on the data sheet(s) and/or on the production traveler.
- 4.2 The technician is responsible for verifying that the test and measurement equipment used in this procedure has been calibrated and that the calibration sticker (date) has not expired as per RHIC-MAG-Q-1000.

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- 4.3 The technician is responsible for notifying the technical supervisor and/or the cognizant engineer of any discrepancies occurring during the performance of this procedure. All discrepancies shall be identified and reported as per RHIC-MAG-Q-1004.

5. Preparation for Delivery:

N/A